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ABSTRACT

The greenhouse effect has always existed. Without the greenhouse effect, Earth could well have the oven-like environment of Venus or the deep-freeze environment of Mars. There is some debate about how much the Earth's surface temperature will rise given a certain amount of increase in the amount of greenhouse gases such as carbon dioxide, nitrous oxides, chlorofluorocarbons, methane, water vapor, and ozone. The activities in this document are designed to encourage students to explore the issue of the greenhouse effect and its future implications, envisage and assess various solutions, share ideas with other students and the community, and adopt appropriate actions to limit the greenhouse effect. The activities, which are suitable for photocopying, are designed for use by secondary students. Topics include: (1) "Background to the Greenhouse Effect"; (2) "Once Upon a Time"; (3) "Keeping Cool and Dry Inside"; (4) "Designing New Cities"; (5) Greenhouse Fun and Games"; (6) Changing Coastlines"; (7) Where Will the Tourists Go?"; (8) "Trees Can Help Us"; (9) "Running Hot and Cold on Coal"; (10) "Changing Things for the Better"; (11) "Living in a Greenhouse Culture"; and (12) "Beyond the Greenhouse Culture." A list of audiovisual and print reference materials is appended. (CW)

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THE GREENHOUSE EFFECT

& BUILT ENVIRONMENT EDUCATION

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A PROJECT OF

The Royal Australian Institute of Architects

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THE GREENHOUSE EFFECT AND BUILT ENVIRONMENT EDUCATION

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The Royal Australian Institute of Architects

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Introduction

These **Greenhouse Effect** activities have been developed by the Royal Australian Institute of Architects as a contribution to **World Environment Day, 5 June 1989,** which has as its Australian theme **Living in a Global Greenhouse.**

The activities are designed to encourage students to explore the issue of the greenhouse effect and its future implications, to envisage and assess various solutions, to share their ideas with other students and the community, and to adopt appropriate actions to limit the greenhouse effect.

The activities, which are in the form of worksheets suitable for photocopying, are designed for use by secondary school students although, with modification, they could be suitable for primary students.

The **aims of the activities** are to:

* increase student awareness and understanding of the greenhouse effect and its implications;
* encourage students to think critically and creatively in proposing resolutions to the practical problems arising from the greenhouse effect;
* encourage students to make proposals which could bring about changes in their environment and to act on these as appropriate, with particular reference to more efficient uses of energy and energy conservation lifestyles;
* encourage students to communicate their findings on the greenhouse effect to the community and to involve the community in appropriate actions.

Background to the Greenhouse Effect

The greenhouse effect has always been with us. Indeed without the greenhouse effect our planet could well have the oven-like temperatures of Venus (with its very dense carbon dioxide atmosphere) or the deep freeze environment of Mars (with its very thin carbon dioxide atmosphere). If the amount of greenhouse gases is increased the planet's surface temperature increases; instead of heat energy escaping into space, the gases reflect it back onto the planet's surface, causing a progressive warming. There is no controversy about this. But there is some debate about exactly how much the Earth's surface temperature will rise given a certain increase in greenhouse gases such as carbon dioxide, nitrous oxides, chlorofluorocarbons, methane, water vapour and ozone.

Some predicted outcomes of the greenhouse effect include:

* the Earth may be getting warmer
* the middle latitude regions may become warmer and drier
* the dry tropical regions may become drier while wet tropical regions become wetter
* fiercer and more frequent tropical cyclones may occur
* polar ice may begin to melt
* sea levels may rise
* plant growth may become more vigorous in some plants and in some regions.

Additional information about the greenhouse effect can be found in the references.

THE AGE, Saturday 12 November 1988

EDITORIAL OPINION

Greenhouse is cause for world concern

FOR some years now, scientists have warned of the greenhouse effect and its global implications. At first, the reaction of governments and of individuals was one of scoffing disbelief. People found it hard to take seriously the idea that over the next 50 years the earth could heat up to the point where the polar ice caps would melt, leading to an appreciable rise in sea levels and in turn to mass flooding. Such a scenario, it was felt, was the stuff of science fiction, and not to be taken seriously.

'But lately governments and their agencies have been sounding a different tune. There is now a growing recognition that, far from being a figment of scientists' imagination, the greenhouse effect is indeed cause for world concern. The Environment Minister, Senator Richardson, was not exaggerating when he told last weekend's Greenhouse '88 conference that the greenhouse effect was the greatest environmental problem facing humanity this century. Greenhouse could not be dismissed as just another isolated environmental problem, he said. It was powerful evidence that our continuing abuse and over-use of the earth's finite and life-sustaining resources must stop.

The looming problem has its origin in our ever-expanding reliance on fossil fuels — oil, coal and natural gas — which, when burned for energy, give off carbon dioxide. This, in turn, acts as a blanket preventing heat from escaping from the earth's atmosphere. If nothing is done to reverse this trend, the result could be heavy inundation, the repercussions of which would be enormous for both coastal and small island communities. The United Nations has set in train a top priority inter-governmental study group which will analyse the scientific data now available and consider the various policy options. Within three years it hopes to produce a practical plan for dealing with the question. It may be that what will be recommended is a mass program of reafforestation, as well as stern pollution controls. Meanwhile, what is important is that the Australian Government, like governments around the world, recognises that there is indeed a problem, and that it will require vision and global cooperation if environmental catastrophe is to be averted.

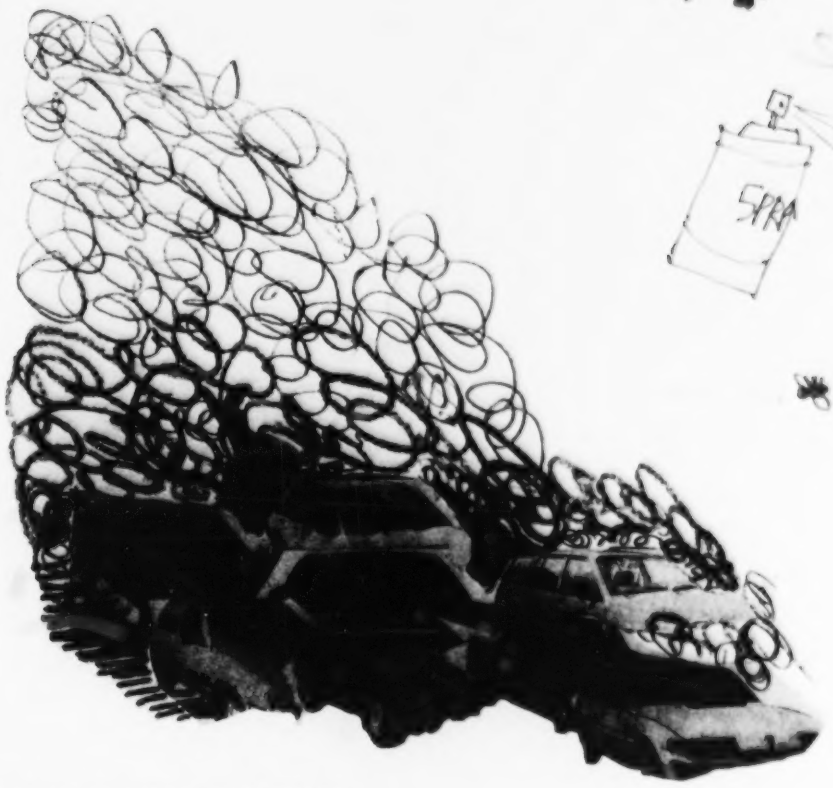
About the activities

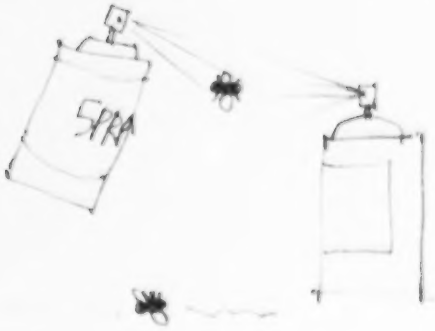
These activities have been developed as examples of environmental education and design education. Thus, they encourage students to examine their own behaviours and attitudes in relation to greenhouse issues, to critically evaluate them and to suggest and adopt other behaviours and attitudes where appropriate. It is assumed that by focusing on their own lifestyles and actions that students will find the learning experiences to be interesting and meaningful. The activities are also intended to encourage students to be creative and imaginative rather than mere information gatherers, although in pursuing their creative interests it is anticipated that students will acquire further knowledge and understanding of the greenhouse effect and its implications.

- **Once upon a time** examines products, appliances and amenities which in recent times have contributed to greenhouse gases in the atmosphere and invites consideration of alternatives to them.
- **Keeping cool and dry inside** focuses on generating design alternatives for buildings as a response to climate change.
- **Designing new cities** invites consideration of decision-making alternatives in the location and design of cities (and consideration of who should make such decisions).
- **Greenhouse fun and games** is a light-hearted stimulus to imaginative "play" with the greenhouse concept.
- **Changing coastlines** focuses on the possible impact of rising sea levels on our lifestyles and invites students to consider appropriate responses to these circumstances.
- **Where will the tourists go?** uses one possible future scenario for tourism as a stimulus to further investigation of the consequences of global climate change.
- **Trees can help us** focuses on possibilities for reversing global trends toward deforestation.
- **Moving people** invites students to consider the public and private transport options relevant to their own lifestyles.
- **Running hot and cold on coal** examines the uses of electricity and the impact of reducing the use of coal for its generation.
- **Changing things for the better** involves students in brainstorming some personal actions to limit the greenhouse effect and in pledging to become Greenhousebusters.
- **Living in a greenhouse culture** compares summer now with summer in the year 2061 in a future "Greenhouse Culture".
- **Beyond the greenhouse culture** looks at the architecture of the "Greenhouse Culture" from the perspective of a 31st century archaeologist and invites students to seek an explanation for it.

Once upon a time...

how did we manage without...?





For discussion and action

- How does each of the above contribute to the greenhouse effect?

- Before we had the appliances, products and industries illustrated above, what **did** we use to provide us with similar services and amenities? Have their consequences for human lifestyles been wholly for the good?

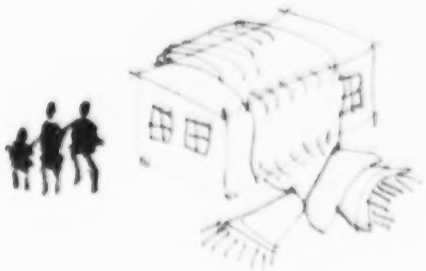
- Describe or design some alternatives to each of the above which could reduce the contribution of human activities to the greenhouse effect.

Keeping cool and dry inside

Studies of the greenhouse effect suggest that Australia's climate is likely to change in the following ways:

- average temperature increases of 1°- 4°C
- seasonal rainfall changes (heavier rains and more flooding in some areas; less rain and more droughts in others)
- more tropical cyclones (strong winds and heavy rain) and cyclones occurring further south.

Existing buildings have been designed for the present climate. How suitable will they be if the climate changes listed above take place? What changes might we need to make to them?



For discussion and action

- Assume that there will be changes to the climate in your locality, for example, that it will be warmer and wetter and that local flooding and strong winds are more likely than at present.

- Draw a plan of your house and garden as it is now. Make sure you show the location of tall trees, positions of windows, direction of drainage and the north point.

- Draw a plan of your house and garden showing the changes you would make to it for comfortable living with the predicted climatic changes. Remember that fossil fuels may become more scarce and that use of electricity may be restricted (much of Australia's electricity comes from coal-powered generators and the combustion of coal adds to the greenhouse gases); thus, you may not be able to rely on electric-powered air conditioning to keep your house cool. In such circumstances, consider the use of foil insulation for weather proofing and insulation, and insulating batts which can be an important asset in helping to keep houses and other buildings cooler. Discuss with your family how you could make the changes to your house and garden.

- Now look at your school buildings. What changes would you need to make to them or their surroundings to make them more comfortable if the climatic changes are as predicted? Make some sketches of your redesigned school and display them around the school. Discuss your suggestions with your school's principal and/or council.

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Designing new cities

DEPARTMENT OF THE PREMIER
MEDIA RELEASE
Government announces new city venture!

The Premier announced today that she is appointing an expert panel to make recommendations on the location and design of a major new city which will be designed specifically to meet the needs of a greenhouse culture...

Some people who have been suggested as possible members of the expert panel include:

Surfie Sue, who believes that most Australians prefer living near the sea and that the city should be sited as close as possible to the coast even if sea levels are going to rise.

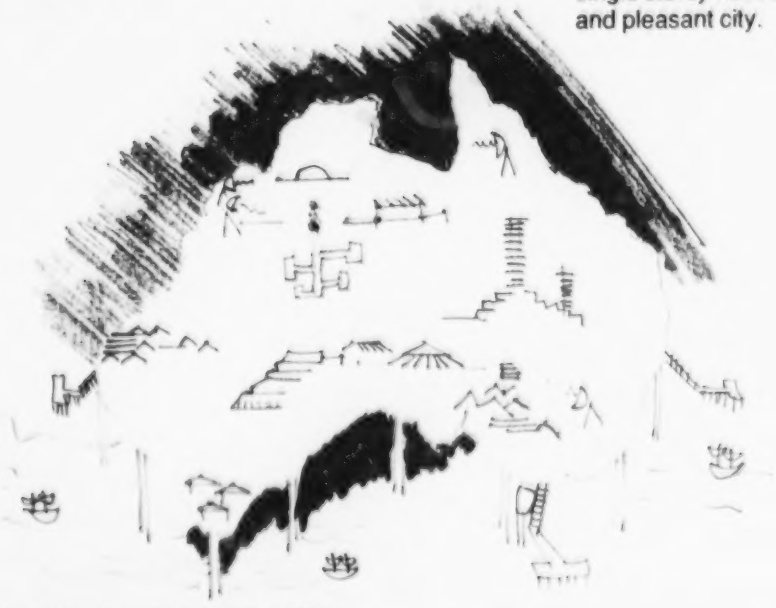
Mountaineer Midge, who likes to ski and walk in the high country and believes that many Australians do not understand or appreciate the advantages of living and working there. Midge is worried about sea level rises and thinks the city should be at a high altitude.

Communicator Chris, who recognises the importance of communication links and believes that the new city should be as close as possible to existing major population centres and the capital city.

Highrise Harris, who doesn't particularly care where the new city is as long as it has plenty of commercial premises and office space. Harris likes to joke that very tall buildings are best suited to global warming because as the sea level rises people can move higher up the buildings and use boats to travel between them!

Architect Ali, who wants the buildings to be the best ever designed in terms of energy efficiency and suitability for any climatic change.

Bungalow Basia, who sees the new city as an opportunity to demonstrate that lowrise buildings and single storey houses can be the basis for an efficient and pleasant city.



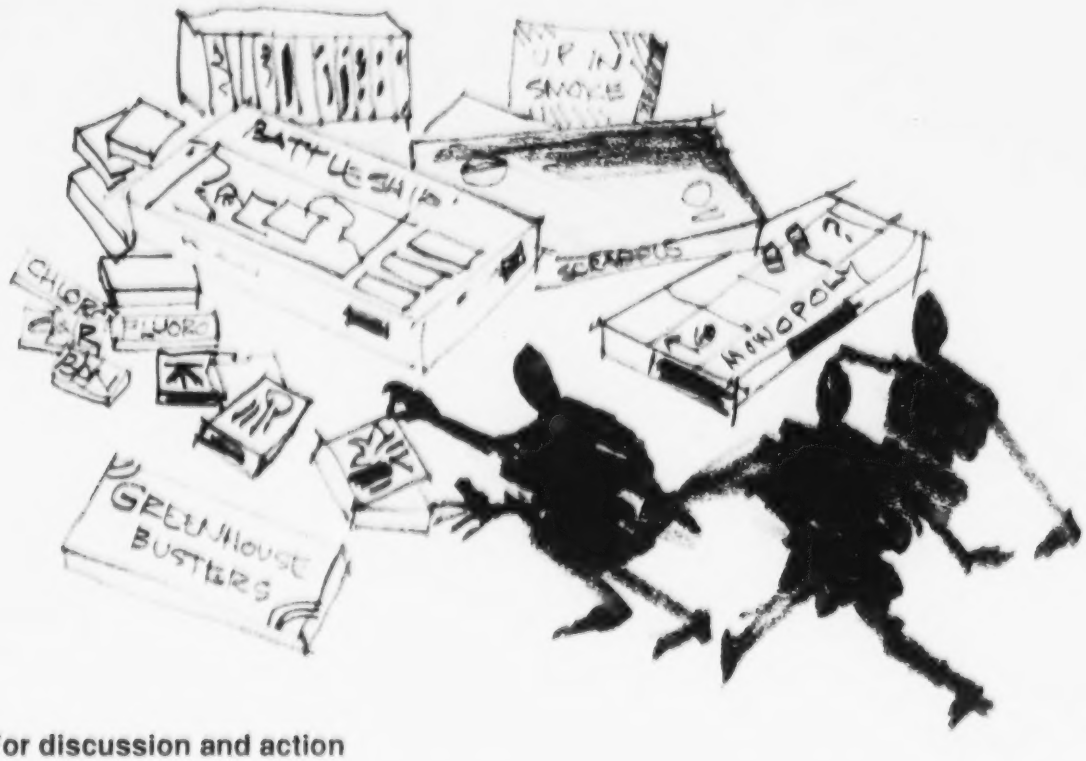
For discussion and action

- Your class is to assist the expert panel in its work. Divide the class into six groups each of which will assist one of the panel members. Each group should prepare supporting materials for the panel member they are assisting. Thus, the groups assisting Sue, Midge and Chris will consider locations (you will need a map of your state or territory) and the groups assisting Harris, Ali and Basia will develop building designs.

- You might wish to add or delete people from the expert panel. How would you go about determining the membership of such a panel? What kinds of interests should be represented?

Greenhouse fun and games

Games, for both children and adults, are reflections of our society and culture at a particular time. For example, the board game *Monopoly* was invented during the economic depression of the 1930s whereas video games like *Space Invaders* are products of more recent interests.



For discussion and action

- Design an original board game (or video game or any other sort of game or puzzle) for a "greenhouse-conscious" society.

- You might also consider modifying existing games and/or working out some of the "greenhouse implications" of existing games. For example:

- What is the longest word you can make in a game from the letters of the word "chlorofluorocarbon"? Where would you place this word on the ***Scrabble*** board to earn the maximum number of points?

- Invent a greenhouse question for each category used in ***Trivial Pursuit.*** For example, Sport: which sport contributes most to the greenhouse effect? Arts and Literature: what was the title of George Turner's 1987 novel about the future consequences of the greenhouse effect on Melbourne?

- Design a version of ***snakes and ladders*** where the reasons for going "up the ladders" or "down the snakes" are related to the greenhouse effect.

- Design a greenhouse effect ***crossword puzzle.***

Changing coastlines

Greenhouse-effect protection planned for Gippsland Lakes

The State Government plans to protect the Gippsland Lakes from the greenhouse effect by prohibiting development in areas less than one metre above sea level.

The plan was announced yesterday by the Minister for Planning and Environment, Mr Roper, who said it was the first step by the Government to develop strategies to deal with the impact of rising sea levels. (Scientists say the warming of the atmosphere may melt polar ice and raise the sea level.)

Mr Roper described the Gippsland Lakes as a main tourist and recreation resource that attracted more than 900,000 people, who spent an estimated $100 million, each year.

The plan recognised the need for several tourist facilities — including water quality — and suggested places where these could be developed without harming the environment, he said.

THE AGE, Thursday 22 December 1988

Some predicted consequences of rising sea levels include:

- dramatic effects on the location of coastlines and the courses of rivers affecting roads, housing, ports and harbours;
- disruption of the tourist industry as beaches and roads disappear;
- disturbance to food chains as wetlands (breeding grounds for many birds and fishes) are drowned;
- deterioration of water quality as the water table rises - suitable drinking water may be harder to find.

Engineers have suggested that sea walls should be built as barricades against rising sea levels.

For discussion and action

If you live in a coastal town or in a beachfront suburb of a coastal city

What would be the effects on your locality and community of the sea level rising one metre? Describe these effects in a way which could be used by a local newspaper (e.g. a letter to the editor, a news item, a sketch, or a map).

How would your own lifestyle be affected?

What do you think your local government (e.g. city or shire council) should be doing about the greenhouse effect (if anything)? If you think it is appropriate, send your responses to these questions to your local newspaper or local council.

If you live in an inland town or city

Consider the following question very carefully: to what extent is the lifestyle you now enjoy dependent on the interaction of your locality and community with that of coastal towns or cities?

How then, might your own lifestyle be affected by the disruption to coastal towns or cities that would be caused by the sea level rising one metre? Describe these effects in a way which could be used by a local newspaper (e.g. a letter to the editor or a news item).

What do you think your local government (e.g. city or shire council) should be doing about the greenhouse effect (if anything)? If you think it is appropriate, send your responses to these questions to your local newspaper or local council.

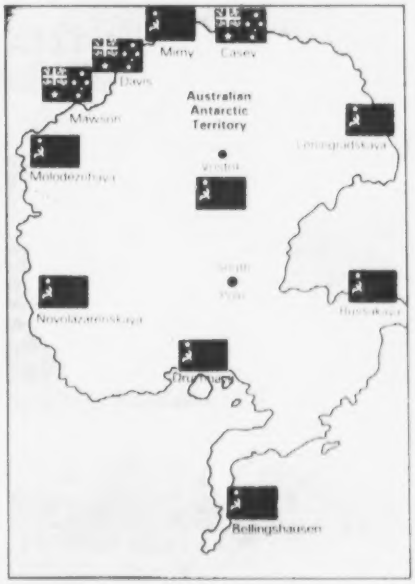
Where will the tourists go?

Early in the next century we may very well see travel posters that look something like this:

It's just three hours away, and has more natural beauty than just about any country on earth.

You will find a range of hotels from top international standard to budget priced. And they are ideally located to suit your choice of outdoor activity, be it skiing, fishing, golfing, trekking or whatever.

For further details, see your travel agent.



Antarctica

the all-year paradise.

Antarctica poster © Project IF: Victoria College Centre for Studies in the Curriculum. Used by permission.

For discussion and action

- List possible reasons for the changes in Antarctica which might make it an "all-year paradise" for tourists. What evidence is there that these changes might come about?
- In the 21st century, what other places in the world might be very different from the way they are now? Design a poster to attract tourists to one of these changed places. Describe **your** holiday there.
- Consider the locality in which you now live. How might it have changed in fifty years' time?
- What might its attractions to tourists be then?
- Design a poster or other display to promote tourism in your locality in fifty years' time.

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Trees can help us

Trees and forests have an important role in regulating the amount of carbon dioxide in the atmosphere because plants take in carbon dioxide and give out oxygen in the process of photosynthesis. Thus, forests reduce the amount of carbon dioxide in the atmosphere.

But the world's forests are fast disappearing. The area covered by tropical rainforests decreased from 9.97 million square kilometres in 1945 to 5.76 million square kilometres in 1986. The projected total for the year 2000 is 3.36 million square kilometres - a loss of approximately two thirds of the forests in 55 years.

In Australia about half of our native forests have been cleared since 1788. Only five per cent of the continent is now covered by native forests.

The loss of tree cover is contributing to other problems such as land degradation. It is predicted that reversing the global trend of deforestation would slow down the rate of global warming significantly as well as having other benefits.

For discussion and action

- Many people have a special tree or like a particular type of tree. Many people have written stories and poems about trees, composed songs about trees, painted pictures of trees and taken photographs of trees. Try to find some examples of these in your school library or elsewhere. One particularly good example is **The Giving Tree** by Shel Silverstein (London: Jonathan Cape, 1987) which tells the story of a relationship between one tree and one child as they live and grow together. What's so special about trees?

- Take a notebook and pencil and go and sit under or in a big tree. Feel the tree and smell it. Close your eyes for a few minutes and listen. Then write down what you heard and felt about that tree and that place. Now try to imagine a world without trees. How would you feel then?

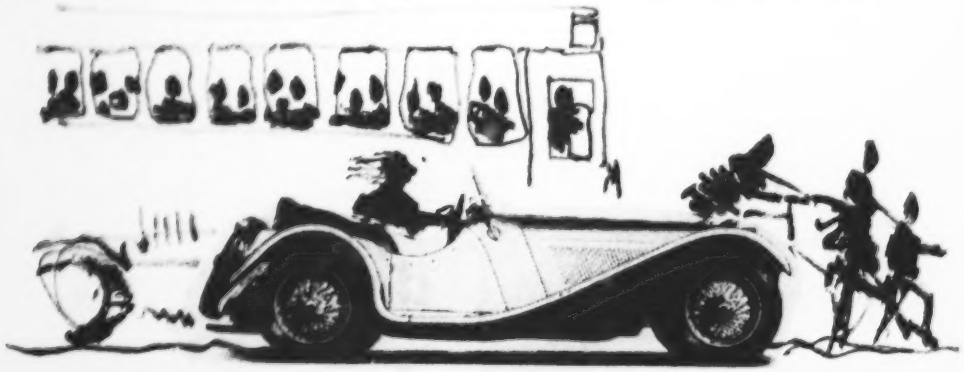
- With other members of your class, "treevaluate" your school grounds: could they be improved by some tree planting or other forms of revegetation? If so, devise a plan for such planting, taking into account the need for continuing maintenance of the areas under consideration. Discuss your class's plan with the school council and try to get it put into practice. You may find it useful to talk to local members of the Society for Growing Australian Plants about suitable plants for your locality.

- There are a number of organisations concerned with reforestation at the state, national and global level. These include the Australian Trust for Conservation Volunteers, the National Tree Program and World Wildlife Fund Australia. Contact one or more of these organisations and find out how you can become involved in ways of reversing global deforestation.

Moving people

A major contributor to the rapidly accelerating greenhouse effect is the increasing level of carbon dioxide in the atmosphere. It is believed that the concentration of carbon dioxide in the atmosphere is 25% higher than it was at the beginning of the industrial revolution.

A significant contribution to the level of atmospheric carbon dioxide is made by the burning of fossil fuels (coal, oil, petroleum, gas etc.) in transport vehicles and for electricity generation. If we are to reduce the carbon dioxide concentration by reducing fossil fuel consumption then our uses of transport and electricity need to be made more efficient by, for example, decreasing the inefficient use of private motor vehicles and increasing the efficient use of public transport.



For discussion and action

Efficiency of private motor vehicles
Survey your class (and other classes) to find out how each student and teacher travels to and from school and the distance between their home and school. If they travel by car find out how many people travel in it and if there is an alternative means of transport available.

Survey your class (and other classes) to find out how other members of students' families travel to or from work, school, shops, etc.

Count the numbers of passengers in cars travelling down a local (busy) street at several different times of the day for one week.

What do your findings from these surveys tell you about the efficiency with which private motor vehicles are used at present?

Reducing fossil fuel consumption
Design a publicity campaign (e.g., posters and/or other media) to promote energy efficient modes of transport, such as walking, bicycling, trains and trams, for travelling to school and elsewhere.

Discuss with other classes and your family the importance of reducing fossil fuel consumption.

Making it easier to be energy efficient in transport
Are there enough bicycle paths in your locality? If not, draw a plan showing some alternative possibilities for new bicycle paths, perhaps paying particular attention to paths which would make it easier for more students to ride bicycles to and from your school. Send the plans to your local council.

If more students rode bicycles to school, would your school have enough bicycle racks? If not, discuss with your principal the possibility of getting more. Perhaps your class could help to design and/or build them.

Alternatives to fossil fuels for transport
Some alternatives to vehicles powered by fossil fuels include vehicles which are biomass fuelled or powered by solar cells or electric batteries. If the use of such vehicles became more common, how would this affect the design of our cities and dwellings?

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Running hot and cold on coal

At present much of Australia's electricity is generated by burning coal. Burning coal releases carbon dioxide which makes a significant contribution to the increase of greenhouse gases in the atmosphere. For example, two kilograms of carbon dioxide are produced in generating the electricity needed to keep a light bulb burning for ten hours. Overall, the average Australian household is responsible for the production of about ten tonnes of carbon dioxide per year from electricity consumption. Australia is also a major exporter of coal.

Greenhouse effect fight may hurt coal exports, says Wran

Australia's coal exports could suffer as Western nations responded to the greenhouse effect, possibly with a ban on coal as a fuel, the CSIRO chairman, Mr Wran, said yesterday.

If, as proposed at a recent meeting in Toronto, industrialised nations agreed to a 20 per cent drop in global carbon dioxide emissions by the year 2005, the implications for the Australian economy would be enormous.

Mr Wran, opening the Australian Conservation Foundation's annual conference in Sydney, said carbon dioxide, one of the worst gases contributing to the greenhouse effect, was produced by burning coal, oil and gas. To reach an agreed reduced target, it was possible that industrialised nations could ban coal as a fuel.

A decision like this would put conservationists on "the horns of a dilemma", forcing them to at least consider the nuclear alternative.

Mr Wran said politicians and scientists were starting to meet the challenges of the greenhouse effect. The Prime Minister, Mr Hawke, had recently proposed a South Pacific network to monitor the effects of climatic changes.

The Resources Minister, Senator Cook, had placed the issue first on the agenda for a new National Energy Consultative Council, set up a few weeks ago.

The council, which would include the ACF, would look at how the problem might alter demand for Australia's energy exports. It would also seek ways to reduce the effect by energy conservation and alternative sources — solar, wind and wave.

Said Mr Wran: "As sure as night meets day, unless we accept that the greenhouse effect is one of the world's greatest environmental problems, the lifestyle and the economies of the world will, in the course of the next generation, undergo dramatic and drastic changes.

"Ten years ago, most of us had never heard of the greenhouse effect. Now most Australians have not only heard of it, but understand that it threatens their lifestyle.

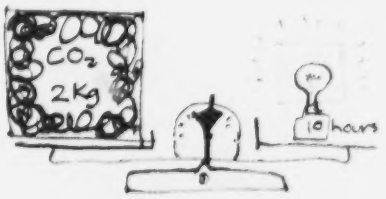
"Some authorities have even been saying that before 50 years are out we will be praying for nuclear energy," Mr Wran said.

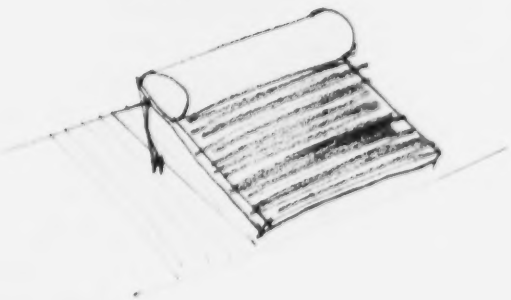
THE AGE, Saturday 8 October 1988

For discussion and action

- If coal is banned as a fuel then it has been suggested that conservationists would be forced "to at least consider the nuclear alternative". Can you suggest other alternatives that might reduce energy demands and consumption?

- Shower water heated by electricity generated using brown coal produces three times more carbon dioxide in the atmosphere than if the water was heated by natural gas. A shower with water heated by solar energy would produce no carbon dioxide. Survey your class to see how water is heated in each home. Why don't more people use solar water heating? Discuss the possibility of switching to solar water heating with your family. Design a publicity campaign to promote non-coal powered sources of energy.





Changing things for the better

Barry Jones, the Minister for Science, Customs and Small Business, said recently -

"I approach the greenhouse problem in the spirit of Pascal's wager to cut down the production of greenhouse gases.
If we take action and disaster is averted, there will be massive avoidance of human and social loss and suffering.
If we take action and there is no problem (i.e. a period of global cooling occurs for other reasons) then little is lost - indeed we should gain cleaner air and environment anyway.
If we don't take action and disaster occurs, it will be a vast global tragedy.
If we don't take action and there is no disaster, the outcome will be due to luck alone."

We can all act to limit the release of greenhouse gases by changing our personal behaviour in a number of areas. In general terms we can -

* reduce the burning of fossil fuels by motor vehicles and in electricity generation
* stop deforestation proceeding at its present rate
* plant more trees to absorb the carbon dioxide from the air
* stop using products containing chlorofluorocarbons (CFCs).

For discussion and action

Using the following headings as organisers, brainstorm a list of actions that you can do to help limit the greenhouse effect

RECYCLING

ELECTRICITY

TRANSPORT

TREES AND THEIR PRODUCTS

* CFCs

HOUSING

From this large list select five actions which you believe you will be able to do for the next month. Write these down and give the list to your best friend. This is your **Greenhouse Pledge**. In one month's time ask your friend to check that you are keeping to your pledge. If you are, add another five actions and welcome to the **Greenhousebusters.**

If you have not kept your pledge you should try harder and maybe next month you can be a **Greenhousebuster** too!

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Living in a greenhouse culture

What will it be like to live in the next century? What will people of the mid-21st century think about what we did (or did not do) about the greenhouse effect in the 1980s?

In **The Sea and Summer** novelist George Turner has imagined the rise (and eventual collapse) of a "Greenhouse Culture" in Australia during the 21st century. In the following excerpt, Alison Conway, writing in the year 2061, reminisces about growing up in Melbourne in the 1980s.

When I was a little girl going to kindergarten we had the annual glories of the sea and summer. We brats - at that age we are all brats with angel smiles hiding the designs of demons - paddled from the beach at Elwood while the sun showered down bright splinters on the blue-green bay.

Summer! Paradisal time of cold drinks and coloured salads, skimpy frocks and games under the garden hose, days at the seaside with sunburn and jellyfish, sand and seaweed and lush wavelets of cuddling water. Playtime without end!

Yet every year there was an end called winter with lead heavy clouds and storms on the bay, long woollies and cold mornings, rain on window panes and the fear that summer might not return.

Summer always returned. It was winter that faded imperceptibly from the round of the planet's seasons while magical summer grew humid and threatening and tropically wet. There were mild winters, then warmish winters, then short winters that merged into extended autumn without any real winter at all. Sleet and hail and frost became memories of 'the old days' and their occasional freak appearances disturbed us, menacing the new order of perpetual summer, perpetual holiday.

Lovely changes came to our gardens as plants were tricked by the falsehoods of the weather and some grew to extraordinary sizes. Roses like sunflowers, dandelions half a metre tall, pansies like velvet plates! *It's the extra CO_2* explained the neighbourhood know alls, *it feeds some plants but kills others*. Which others? We saw no others; they had died off and gone away. They explained, too, that the CO_2 was a farming disaster, that the wheat belt was shifting south and being crammed against the coast and the old wheat belt was already a dust bowl, forcing whole populations to move and leave ghost towns whispering in an empty countryside.

Didn't they know it would happen? Oh, yes, 'they' knew; back in the 1980's 'they' were warned but; they' were busy. 'They' had the nuclear threat and the world population pressure and the world starvation problem and the terrorist outbreaks and the strikes and the corruption in high places, and the endless business of simply trying to stay in power - all to be attended to *urgently*. They weren't attended to; 'they' tried but the troubles were too big, too well entrenched to be amenable to sense or force - and the emerging troubles of the next decade had to be left until there was time, until feasibility studies could be made, the problems seen in proper context, the finance found . . .

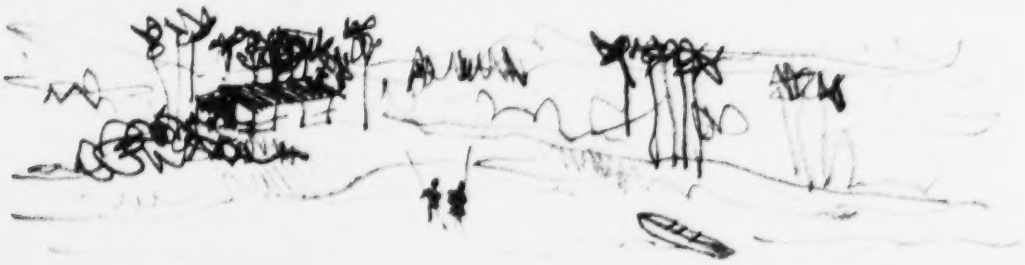
Suddenly the next decade was here, with urgent new disasters and no sign of containment of the old. It couldn't all be blamed on the CO_2 but the saturation level surely helped. Helped us on down to misery and want.

How wonderful it would be now to wake one morning to a near-zero temperature and a wind of winter heralding the old world's return.

Instead we have the sea and summer. The sea is rising over the beaches of the world; the coastal cities face death by drowning. Day by day the water advances up the streets from the shores and rivers; our placid old Yarra was long ago forced over its banks by the rising tides. The coast roads have vanished and the lower floors of the tenements are uninhabitable.

The ageing woman has what the child desired - the sea and eternal summer.

(George Turner, **The Sea and Summer**, London: Faber and Faber, 1987, pp19-20) Reprinted with permission.



For discussion and action

- What are the things that you now enjoy most about summer in the place where you presently live? Which of these are likely to be altered by the global climate changes predicted as a consequence of the greenhouse effect? (You could also answer these same questions for some other place, such as somewhere you have enjoyed a summer holiday recently.)

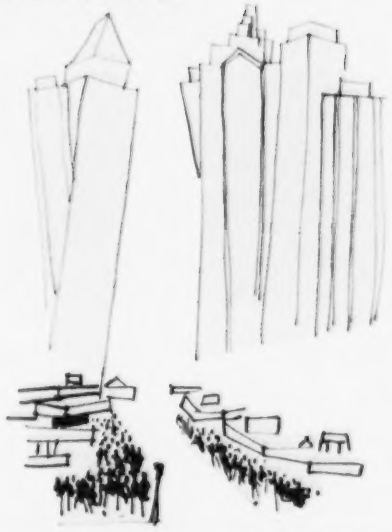
- Imagine yourself in the year 2061 in the place where you presently live. Describe your surroundings (you may like to draw them too) paying particular attention to changes that have resulted directly or indirectly from the greenhouse effect. For example, what are public and private gardens like (if they still exist)?

- What might a future "Greenhouse Culture" be like? Try to imagine - and, if possible, to produce - some examples of Greenhouse art, Greenhouse architecture, Greenhouse clothing, Greenhouse design, Greenhouse fashion, Greenhouse films, Greenhouse music, Greenhouse theatre, etc.

Beyond the greenhouse culture

If all of the disastrous effects of increasing amounts of greenhouse gases in our atmosphere actually occur in the relatively near future (say, by the mid-21st century) what will happen next? What will it be like to live a hundred - or even a thousand - years later? What will people of the mid-31st century think about what happened in the 20th and 21st centuries?

In **The Sea and Summer** novelist George Turner has imagined the rise (and eventual collapse) of a "Greenhouse Culture" in Australia during the 21st century. The following excerpt provides a view of this culture as seen by people living in the early part of the 31st century - more than a thousand years from now.



The sun, high in the early afternoon, sparkled on still water. There was no breeze; only the powercraft's wake disturbed by the placid bay. The pilot's chart showed in dotted lines an old riverbed directly below his keel, but not current flows at the surface; the Yarra now debouched some distance to the north, at the foot of the Dandenongs where the New City sheltered among hills and trees.

The pilot had lost his first awe of the Old City and the vast extent of the drowned ruins below; this was for time a routine trip. He carried hundreds of historians, archaeologists, divers and sightseers in the course of a year.

When this sunken city had reached its swollen maximum of population and desperation, a thousand years before, the sun had blazed throughout the four seasons, but that time was over and would not return.

Not every wall and spire of the Old City lay below the bay. The meeting of the Antarctic ice cap had been checked as the polluted atmosphere rebalanced its elements and the blanket of global heat dissipated; the fullest rise of the ocean level had been forestalled though not soon enough to avert disaster to the coastal cities of the planet. To the north and northeast of the powercraft's position lay the islands which had been the higher ground of Melbourne's outer suburbs, forested now and overgrown, but storehouses of history.

The other ruins, the other storehouses, part submerged, were clusters of gigantic towers built (with the blind persistence of those who could not believe in the imminence of disaster) in the lower reaches of the sprawling city. There were ten Enclaves, each a group of nearly identical towers whose designs had varied little in the headlong efficiency of their buildings. The Enclave now approached by the powercraft was one of the largest, a forest of twenty-four giants evenly spaced in an area of some four square kilometres opposite what had been in that far time the mouth of the Yarra. It was shown on the pilot's chart as Newport Towers, with the caution Erratic Currents, a notation common to all the Enclaves. These ancient masses, each more than 100 metres on a side, created races and eddies at change of tide.

Marin knew that what he saw were only the lower hulks of buildings which had stretched at the sky. Their greedy height had not withstood the eroding sea and the cyclones of destablised weather patterns. Not one had endured entire; most were only sub-surface stumps of their hugeness, splintered jawfuls of broken teeth. It was difficult to conceive of them in their unpleasant heyday, twenty-four human warrens, each fifty to seventy stories high and verminous with the seething humanity of the Greenhouse Culture.

He lived in a world where architecture favoured concern for surroundings, where stairways were thought of as an inconvenience and two-floor dwellings, a rarity; processing conditions occasionally demanded excessive height in factories and these were bounded by restrictions of design and position.

(George Turner, **The Sea and Summer**, London: Faber and Faber, 1987, pp3-4) Reprinted with permission.

For discussion and action

The Old City of "clusters of gigantic towers" is a vision of a **possible** future for Melbourne in the mid-21st century. Why might "the seething humanity of the Greenhouse Culture" have built "the Enclaves"(like Newport Towers)? Is something similar to what Turner describes **likely** to occur? What might make such a future less likely to occur?

Have there been any examples of people in the twentieth century behaving "with the blind persistence of those who could not believe in the imminence of disaster"? Why might people behave in this way?

Some of the 31st century characters in Turner's novel make use of a historical document of some 5000 pages titled **A Preliminary Survey of Factors Affecting the Collapse of the Greenhouse Culture in Australia**. What do you imagine some of the entries in this document might be?

In what ways would our present society have to change for it to become like Marin's world ("where architecture favoured concern for surroundings, where stairways were thought of as an inconvenience and two-floor dwellings a rarity")?

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References

Audiovisual materials

Griffiths, L. (1988) **The Greenhouse Effect - A Global Dilemma.** South Melbourne: Educational Media Australia (20 slides with teachers' notes).

TV Ontario (c.1988) **The Greenhouse Effect** (videotape of approx. 50 minutes) available from Educational Media Australia.

Print materials

Carney, S. (1988) Poll finds wide concern over greenhouse effect. **The Age**, 12 September 1988.

Cribb, J. (1988) The plants that can save the planet. **The Australian**, 28 December 1988.

Gilmour, A. (1988) Greenhouse... **World Wildlife Fund Australia News No.37,** October-December 1988: 1-2.

Good Weekend. 11 February 1989. (special issue on the environment)

Greenhouse Effect: The Causes and Cures. **The Age**, 31 October 1988.

The Greenhouse Effect: Planning for Climate Change. Supplement to **The Age**, 18 March 1988. (4 pages)

Hare, B. (1988) Remedies for a Fevered Planet: Confronting the greenhouse/ozone question. **Habitat**, June 1988: 11-35.

The Heat Is On. **Time**, October 19, 1987: 60-67.

In Future. Commission for the Future, Carlton. Most issues in 1988.

Mabey, R. (1988) What have we done to our weather? **The Australian**, November 5-6, 19 8.

Nature's Revenge. **Newsweek**, 2 March 1987: 40-45.

Pittock, B. (1987) The greenhouse effect. **Engineers Australia**, February 6 1987: 40-43.

Time Australia, 28 November 1988 (special Australian environment issue: "Earth-Fire")

Time Australia, 2 January 1989 (features Earth as "Planet of the Year")

Turner, G. (1987) **The Sea and Summer** (London: Faber and Faber).

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